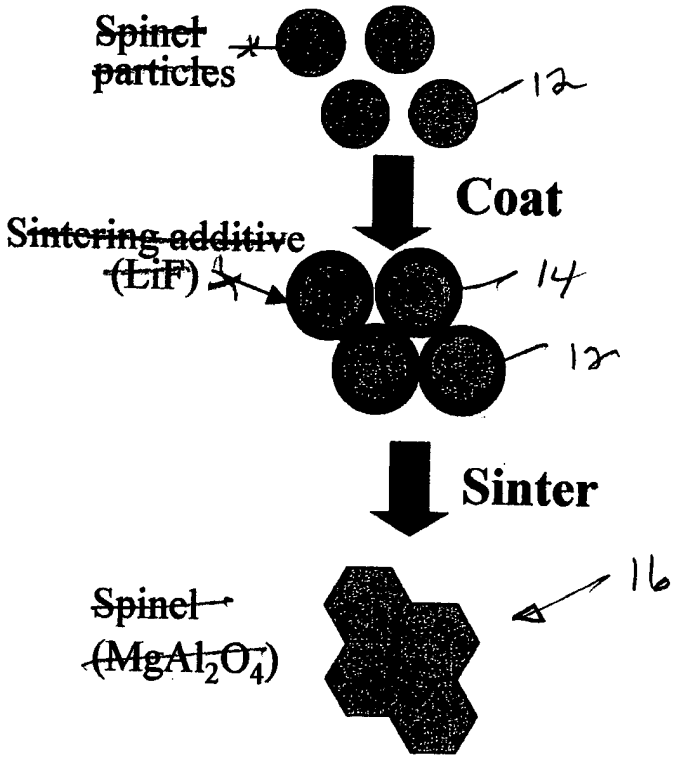
NC 84,352

Technical Approach. How to Improve Sintering

Spray coat: To **uniformly** distribute sintering additives

Fig. 1



Eliminate porosity by **decreasing activation energy for diffusion**

Improved sintering → low porosity, high strength, high optical transmission

Fig. 2

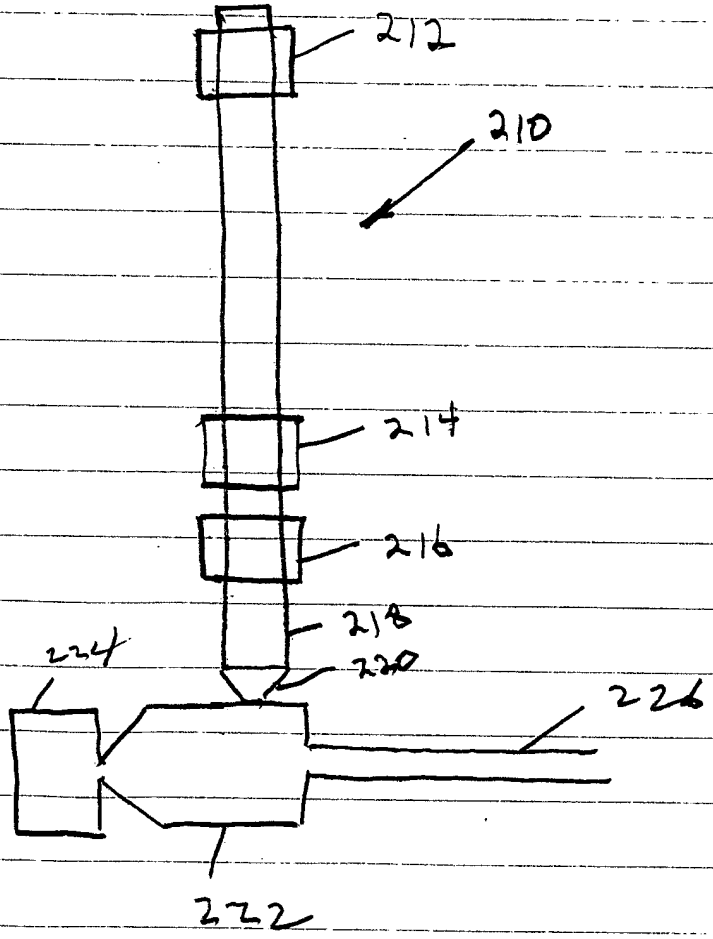
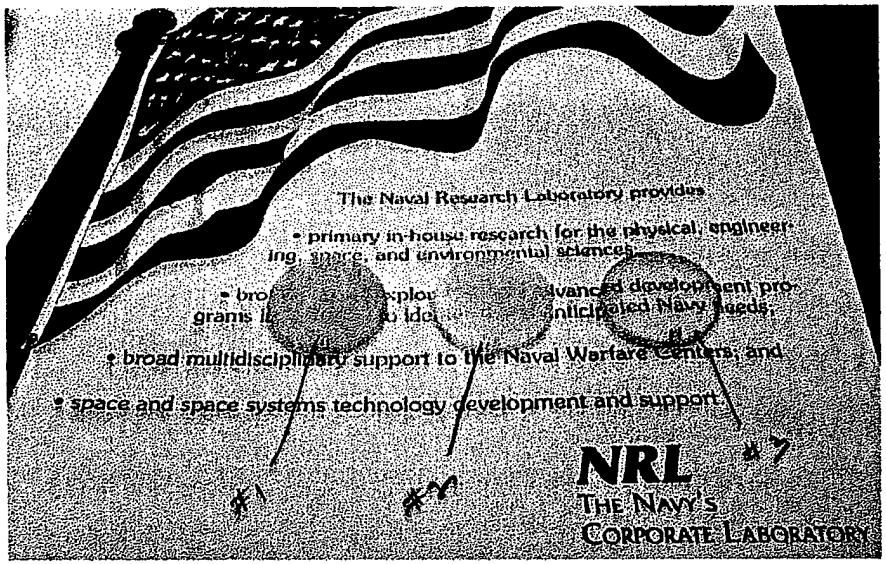


Fig. 2

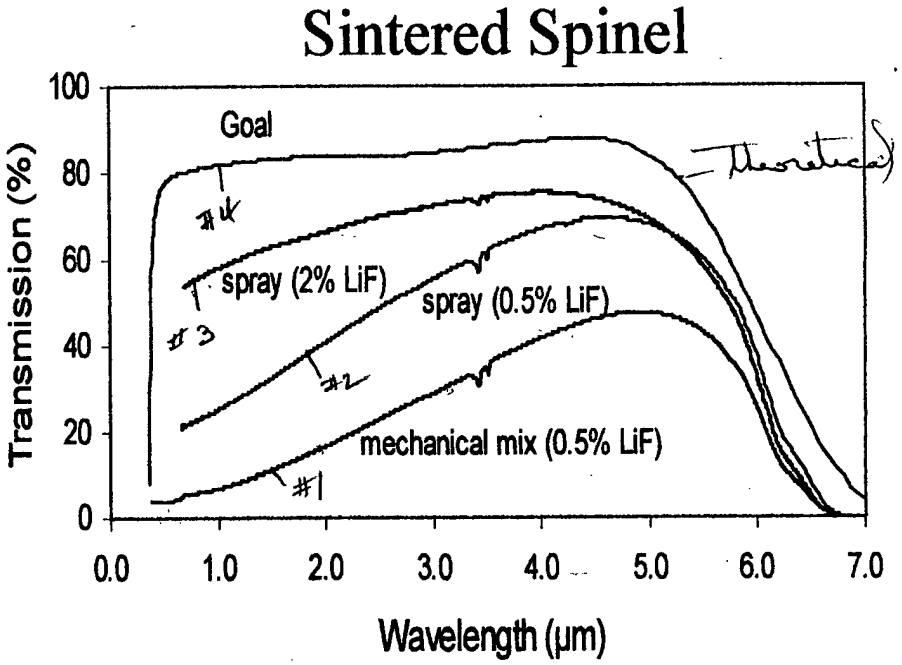
Achievements Optical Transmission

Fig. 4



1" diameter by ~1 mm thickness

Fig. 3



- Traditional mechanical mixing of LiF gives poor transmission
- Spray coating LiF on spinel gives highest transparency

Status of Ceramic Materials for Transparent Armor

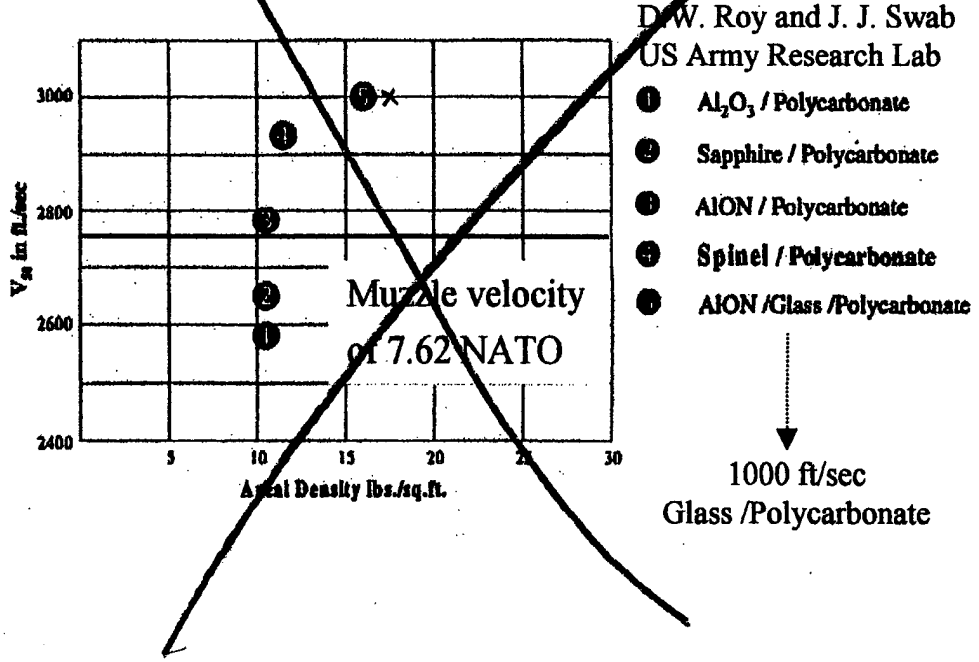
Ceramic Materials Development:

- Polycarbonate/glass laminates
- Aluminum oxide (Al_2O_3)
- Aluminum oxynitride ($Al_{23}O_{27}N_5$) Alon
- Magnesium Spinel ($MgAl_2O_4$)

Fig. 5

	ALON	Mg-Spinel	Alumina	Glass
Density (g/cm^3)	3.67	3.58	3.98	2.51
Elastic Modulus (GPa)	315	277	344	82
Flexure Strength (MPa)	221	241	448	70
Fracture toughness (MPa m$^{1/2}$)	2.1	1.7	1.8	1
Hardness (Kg/cm^2)	1380	1210	2000	610
Transmission range (μm)	0.3-5	0.3-5.5	0.3-4.5	0.3-2

Fig. 7



Ceramic/laminate armors are excellent candidates for Type III and beyond ⟹ **ISSUES**